Thesis/
Reports
Carcasson,
M.

ORGANIZATION AND COMMUNICATION OF RESEARCH RESULTS

Organization and Communication of Research Results

Dr. Martin Carcasson and Elizabeth Sink
Department of Speech Communication
Colorado State University
Fort Collins

Dr. Thomas C. Brown
Rocky Mountain Forest and Range Experiment Station
USDA Forest Service
Fort Collins, Colorado

Final Report
Agreement 06-JV-11221617-145

between
Colorado State University
and
Rocky Mountain Forest and Range Experiment Station

January 2008

RMRS Library
USDA Forest Service
MAR 7 2008
240 W Prospect Rd
Fort Collins CO 80526

This project consisted of two efforts, (a) to improve and update two websites of the Rocky Mountain Research Station and (b) to obtain, analyze, and communicate information on monthly municipal water use.

A. The websites for the Social and Economic Values in Natural Resource Planning work unit (http://www.fs.fed.us/rm/value/) and the Natural Resource Assessment and Analysis work unit (http://www.fs.fed.us/rm/analytics/) were improved and updated to better communicate research results to various stakeholders and interested publics. The details of this work are not reproduced here. The results are self evident in the websites.

B. A report on the effort to provide new nationwide information on monthly municipal water use follows.

Monthly Municipal Water Use in the United States

Although local- and regional-level modeling of water supply and demand has typically been performed at a monthly time step, large-scale modeling has generally been performed at an annual time step. As improved water supply data and models have become available, large scale modeling of water supply at the monthly time step has become possible. However, comprehensive water use data that would be used to estimate water demand, to be compared with water supply data—such as the water use data provided by the U.S. Geological Survey (USGS) (e.g., Hutson et al., 2004; Solley et al., 1983; Solley et al., 1988; Solley et al., 1993; Solley et al., 1998)—are compiled at the annual time step. In order to perform large scale modeling of water supply and demand, annual water use data must be disaggregated to the monthly time step. This would need to be done for the following water use categories: agricultural irrigation, municipal, industrial, thermoelectric, mining, and livestock.

In response to the need to disaggregate annual water use data to the monthly time step, the objective of this effort was to estimate the proportion of annual municipal water use occurring each month for major water basins in the contiguous 48 states of the U.S.

Methods

Lacking a centralized data base of monthly water use, we contacted individual cities (or water companies serving cities, which are considered "cities" herein for the sake of brevity) across the U.S. and requested monthly water delivery data for recent years (we accepted monthly withdrawal data if delivery data were not available). We attempted to obtain data from at least one city in each of the 204 4-digit basins in the contiguous 48 states. Cities of at least 10,000 persons were favored, but in less populated regions we considered cities with at least 2,500 people. The process of obtaining municipal data in many cases required repeated efforts to gain the assistance of city officials familiar with their water delivery data. In all we obtained data on 10,433 months of water use from 238 cities, for an average of 44 months of data per city.

City data were averaged for three sets of watersheds: 4-digit basins, assessment subregions (ASRs), and water resource regions (WRRs). There are 204, 98, and 18 such watersheds in the contiguous 48 states, respectively. The 4-digit basins are a standard hydrologic division supported by the USGS. ASRs and WRRs were delineated by the U.S. Water Resources Council for large scale assessment (U.S. Water Resources Council, 1978). In almost all cases, ASRs and WRRs consisted of combinations of 4-digit basins. To maintain consistency between 4-digit basins and ASRs, and to remove two very small ASRs, we made the following changes to the WRC ASRs (which reduced the number of ASRs from 99 to 98):

1. The WRC had what is now ASR 207 as part of ASR 106. The WRC's ASR 106 spanned two WRRs (1 and 2). We created a new ASR (207) in order to avoid allowing an ASR to span WRR boundaries.
2. The WRC had 4-digit basin 404 as ASR 403. Four-digit basin 404 is a sliver along the SW shore of Lake Michigan, including Chicago. We added 4-digit basin 404 to ASR 404, which already included other Lake Michigan drainages. This eliminated ASR 403.

3. The WRC had 4-digit basin 1301 as ASR 1301. We added 4-digit basin 1301 to ASR 1302. This eliminated ASR 1301.
4. The WRC divided 4-digit basin 1304 into parts of two ASRs (1303 and 1305). We put all of 4-digit 1304 in ASR 1303.
5. The WRC divided 4-digit basin 1507 into parts of two ASRs (1502 and 1503). We put all of 4-digit 1507 in ASR 1503.

The procedure we used for summarizing the city data is as follows:

1. Remove any city without at least one estimate for each month (this step resulted in loss of 2 cities).
2. For each remaining city, use all available data to compute monthly proportions by first computing average delivery for each month and then computing proportions from the monthly averages.
3. Remove a city if the monthly proportions appear to be in error (this step resulted in loss of 4 cities).
4. Compute simple average proportions for all remaining cities within a given 4-digit basin, a given ASR, and a given WRR.
5. Use cluster analysis with the 4-digit and ASR averages to define a small set of clusters of monthly proportions (cluster analyses were performed using the K-means cluster analysis routine of SPSS, which allows the user to specify the number of clusters desired). We limited the number of clusters by restricting cluster size to 5 or more basins or ASRs.

After removing six cities from the data base for reasons explained above, 232 useable cities remained, representing 181 4-digit basins and 91 ASRs.

Results

Table 1 lists the average monthly percentages of water delivery for the 181 4-digit basins, and the number of cities representing each basin. The average and median numbers of cities per 4-digit basin are 1.6 and 1. The simple average monthly proportions for the entire set of basins, listed at the bottom of Table 1, show that monthly use ranges from 6.2% of annual in February to 11.4% in July.

Table 2 lists the monthly percentages of water delivery when the 4-digit basins are forced into four clusters, and Figure 1 shows the locations of the clusters. Cluster 1 contains 115 basins, represented by 154 cities, located largely in the eastern half of the country. Cluster 2 contains 26 basins, represented by 31 cities, in an area centered in the four-corners states (CO, UT, AZ, and NM) but including a few basins in surrounding states. Cluster 4 contains 16 basins, represented by 20 cities, located largely in the northern portion of the West. Finally, cluster 3 contains 24 basins, represented by 27 cities, scattered throughout the western half of the country but concentrated like cluster 2 in the more southern regions.

Figure 2 plots the monthly percentages of the clusters of Table 2. We see that water use becomes more heavily concentrated in the summer and early fall months as we move to drier climates, with cluster 1 showing a more even distribution of use than the three western

clusters. Clusters 2 and 3 show an intermediate level of concentration of water use in the summer months. Cluster 2 experiences the heavy summer use earlier than cluster 3, reflecting the fact that the bulk of basins of cluster 2 are south of those of cluster 3. Generally, the further north one goes, and thus the colder are the temperatures, the later is the onset of the landscape irrigation period. Cluster 4, concentrated in the most northerly intermountain region, shows the most extreme concentration of deliveries in the summer months.

Table 3 lists the monthly percentages of water delivery for five clusters of 4-digit basins, and Figure 3 shows the locations of the clusters. The number of basins per cluster ranges from 5 (cluster 2) to 81 (cluster 1). Figure 4 plots the monthly percentages of the clusters of Table 3. The additional cluster (5), when compared with the four clusters of Table 2, is made up of what in the four-cluster analysis were the drier, western portions of the eastern cluster (1) and portions of clusters 2 and 3. This clustering shows two groups of more extreme distributions, one with maximum use in July (cluster 4) and the other smaller group with maximum use in September (cluster 2).

Comparing the two sets of clusters of 4-digit basins (Tables 2 and 3), one sees that increasing the number of clusters by one, from four to five, results in a substantial rearrangement of the basins. For example, the new cluster 5 of Table 3 is made up of basins from clusters 1, 2, and 3 of Table 2. Clearly the monthly distributions of the basins constitute, in large part, a continuum without obvious separation points, rather than clearly distinct groups.

Table 4 lists the monthly percentages for the 91 of the 98 ASRs for which we have data, and the number of 4-digit basins and cities representing each of the ASRs. The average and median numbers of cities per ASR are 2.5 and 2.

Table 5 lists the monthly percentages for four clusters of ASRs, and Figure 5 shows the locations of the clusters. Cluster 3 contains 45 ASR, represented by 106 cities, located largely in the eastern half of the country. Cluster 2 contains 16 ASRs, represented by 41 cities, covering roughly the northern two-thirds of the West with the exception of the West Coast. Cluster 1 contains 25 ASRs, represented by 72 cities, located in the Great Plains, Southwest, and along the West Coast. Finally, cluster 4 contains 5 basins, represented by 13 cities, two in the upper Great Basin, one in northern California, and two in the headwaters of the Missouri Basin.

Figure 6 shows a plot of the monthly percentages of the clusters of Table 5. As with the 4-digit basin clustering, the most evenly distributed cluster (number 3 in this case) represents the eastern half of the country. The next most evenly distributed cluster (1) represents a mixture of climates. Here the weather is either generally drier than the East, requiring more landscape irrigation whenever the temperatures warrant it (the Great Plains and Southwest), or rainfall is less evenly distributed over the year then the East (as along the upper West Coast). This clustering also shows two groups of more extreme distributions both located in the more northern dry parts of the West, one (cluster 2) with a maximum use in July and the other smaller group (cluster 4) with a maximum use in August.

Table 6 lists the monthly percentages of annual water use for the 18 WRRs, and the number of 4-digit basins and cities representing each of the WRRs. The WRRs are made up of from 3 (WRR 9) to 26 (WRR 10) 4-digit basins. Figure 7 shows the locations of the WRRs. The overall difference in monthly distribution between the eastern and western portions of the country is clearly seen by comparing Figures 8 and 9.

Literature Cited

Hutson, S. S., Barber, N. L., Kenny, J. F., Linsey, K. S., Lumia, D. S., & Maupin, M. A. 2004. *Estimated use of water in the United States in 2000.* Circular 1268. Reston, VA: U. S. Geological Survey.

Solley, W. B., Chase, E. B., & IV, W. B. M. 1983. *Estimated use of water in the United States in 1980.* Circular 1001. Alexandria, VA: U. S. Geological Survey.

Solley, W. B., Merk, C. F., & Pierce, R. R. 1988. *Estimated use of water in the United States in 1985.* Circular 1004. Denver, CO: U. S. Geological Survey.

Solley, W. B., Pierce, R. R., & Perlman, H. A. 1993. *Estimated use of water in the United States in 1990.* Circular 1081. Denver, CO: U. S. Geological Survey.

Solley, W. B., Pierce, R. R., & Perlman, H. A. 1998. *Estimated use of water in the United States in 1995.* Circular 1200. Denver, CO: U. S. Geological Survey.

U.S. Water Resources Council. 1978. *The nation's water resources 1975-2000.* Washington, D.C.: Government Printing Office.

ables

Table 1. Monthly distribution of annual municipal water delivery for 4-digit basins

Basin	No. of cities	Percent											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
101	1	10.0	8.6	8.9	8.1	7.6	7.8	8.5	8.3	7.5	7.8	8.3	8.6
102	1	8.0	7.1	7.8	7.6	8.2	8.5	9.2	9.9	8.8	8.8	8.1	8.0
103	1	8.3	7.5	8.4	8.2	8.4	9.1	9.0	9.4	8.2	8.4	7.5	7.7
104	1	8.3	7.8	8.3	8.0	8.7	8.8	9.1	10.0	8.2	7.8	7.5	7.5
105	0												
106	1	7.4	7.5	7.5	7.8	7.9	9.3	10.1	10.5	9.3	8.0	7.6	6.9
107	1	7.0	6.4	6.9	7.1	8.0	10.1	10.8	11.0	10.0	8.2	7.1	7.4
108	1	8.0	7.2	8.1	7.9	8.4	8.7	10.1	10.4	8.4	8.0	7.4	7.4
109	1	7.5	7.6	7.5	7.6	7.7	9.4	9.9	10.6	9.9	7.8	7.4	7.3
110	1	7.8	7.1	7.4	7.3	8.5	9.2	10.5	10.2	8.9	8.2	7.4	7.5
111	0												
201	1	7.6	6.8	8.5	6.6	6.6	8.8	7.9	9.4	10.9	8.4	8.8	9.7
202	1	8.5	8.4	8.9	8.0	8.3	8.5	8.3	9.0	7.9	8.1	8.0	8.1
203	0												
204	1	9.9	8.1	7.9	7.6	7.7	7.9	9.4	8.2	8.1	9.1	8.1	8.0
205	1	8.1	8.8	7.6	8.3	8.0	8.4	9.0	8.9	9.1	8.1	7.7	8.0
206	3	7.7	7.0	8.0	7.9	9.2	9.1	9.1	10.1	8.0	8.2	7.9	7.9
207	1	8.4	8.0	8.3	8.2	8.6	8.6	8.8	8.9	8.4	8.2	7.4	8.1
208	2	8.1	7.4	7.9	7.7	8.9	8.9	8.8	9.4	8.8	8.4	7.9	7.8
301	1	8.8	7.7	8.4	7.8	8.3	8.2	8.5	8.6	8.5	8.4	8.0	8.7
302	1	7.4	6.6	7.2	7.5	8.6	9.3	9.9	9.9	10.0	8.8	7.5	7.1
303	1	7.6	6.9	8.0	7.9	8.6	8.6	9.3	10.1	9.0	8.9	7.6	7.5
304	1	7.8	7.0	7.8	8.1	8.9	9.1	9.1	9.3	8.8	8.7	7.8	7.6
305	1	7.4	6.7	7.8	8.3	9.9	9.7	10.1	9.8	8.5	8.2	7.1	6.6
306	2	6.5	5.6	6.6	7.9	10.3	9.0	9.5	9.6	10.7	9.2	8.1	6.8
307	1	7.0	6.3	6.1	7.7	8.8	10.5	11.2	10.0	8.7	8.0	8.3	7.2
308	1	7.4	7.1	9.2	8.5	9.7	8.6	8.3	8.7	8.2	8.0	8.5	7.7
309	1	7.7	7.8	8.3	9.0	9.2	8.5	8.5	8.5	7.9	8.4	8.3	7.9
310	1	6.6	7.7	7.4	9.7	10.4	10.7	8.5	8.3	9.6	6.7	6.9	7.5
311	1	8.3	8.3	8.5	8.1	8.3	8.4	8.4	8.3	8.3	8.3	8.3	8.3
312	1	7.2	6.6	8.2	9.3	9.5	10.0	8.7	8.3	8.5	8.5	7.9	7.2
313	2	8.0	7.3	8.1	8.2	8.5	9.1	9.3	8.8	8.1	8.7	7.8	8.1
314	1	7.4	7.5	6.7	7.7	8.9	10.1	8.0	8.4	9.6	9.4	9.2	6.9
315	2	7.5	7.7	6.8	7.9	7.6	9.1	9.4	9.1	10.1	8.6	8.7	7.6
316	1	7.5	6.7	7.3	7.8	8.5	10.0	10.3	9.6	8.5	8.3	7.6	7.9
317	1	8.4	7.8	7.4	7.3	7.3	8.7	9.5	8.9	9.1	8.5	8.6	8.6
318	1	7.0	5.9	5.4	7.2	7.6	12.1	9.7	10.4	10.3	8.3	8.7	7.3
401	1	8.0	7.4	8.2	7.7	8.0	8.4	9.6	9.8	8.8	8.2	7.7	8.2
402	2	7.8	7.5	7.9	8.1	7.6	8.7	10.4	9.8	8.8	8.5	7.4	7.5
403	2	7.8	7.1	7.8	7.6	8.2	9.1	11.1	8.9	8.4	8.3	7.5	8.1
404	1	7.6	7.1	7.7	7.4	7.9	8.5	9.5	10.0	10.0	8.7	7.9	7.9
405	2	6.8	7.3	7.4	6.7	8.0	7.8	9.4	12.1	9.5	9.0	8.8	7.0
406	0												
407	1	8.3	7.5	8.4	8.4	8.6	8.9	9.7	9.1	8.0	7.8	7.5	7.9
408	1	7.9	7.2	7.7	7.5	8.2	9.0	10.6	10.3	9.0	7.8	7.3	7.6
409	1	7.2	6.4	6.8	7.2	8.0	9.6	10.9	10.6	10.6	8.6	7.3	6.9
410	1	7.3	7.2	7.3	7.1	7.4	8.9	8.8	10.1	11.3	8.5	8.0	8.0
411	1	8.3	7.7	8.2	7.8	8.2	9.8	9.6	9.7	8.2	7.6	7.2	7.8
412	0												
413	1	7.8	6.9	7.2	7.9	7.4	11.0	9.7	9.4	8.4	8.4	7.9	7.9

414	0											
415	2	8.8	7.2	8.5	8.2	7.6	8.7	9.4	8.7	8.6	8.8	7.3	8.2
501	0											
502	0											
503	1	8.3	8.4	8.4	8.2	8.2	8.7	8.7	8.7	8.4	8.1	8.0	7.9
504	1	8.3	7.8	8.7	8.3	8.2	8.9	8.9	8.7	8.1	8.2	7.7	8.3
505	1	8.3	8.2	8.5	8.6	8.5	8.3	8.1	8.0	8.9	8.5	8.4	7.8
506	1	7.1	6.5	7.2	7.5	8.8	10.7	10.2	10.7	8.9	8.1	7.1	7.3
507	2	8.7	8.0	8.6	8.0	8.3	8.5	8.6	8.6	8.2	8.1	7.9	8.6
508	1	8.2	7.4	7.9	7.8	8.5	9.1	9.0	10.0	8.6	8.2	7.5	7.9
509	1	7.9	7.2	7.8	7.7	8.4	9.0	10.0	10.6	8.1	8.0	7.4	7.7
510	2	7.9	7.3	7.9	7.9	8.6	9.0	9.6	9.7	8.5	8.3	7.5	7.9
511	1	7.3	6.9	8.6	7.8	8.4	9.1	8.7	9.7	7.9	7.8	9.6	8.2
512	1	7.8	7.4	8.9	8.3	8.6	9.2	9.2	9.4	8.4	8.4	6.8	7.6
513	1	7.7	7.6	7.6	7.9	8.3	9.3	10.1	9.0	8.6	8.4	7.7	7.9
514	1	7.8	6.7	7.2	7.2	8.5	9.9	10.0	10.5	8.6	8.5	7.5	7.5
601	1	7.9	7.7	7.1	8.1	7.9	8.7	9.6	8.9	9.2	8.7	8.0	8.2
602	1	7.7	7.8	7.6	7.6	8.6	8.9	9.1	9.1	8.6	8.6	8.3	8.3
603	1	7.7	7.4	7.4	7.7	8.6	8.7	9.2	9.3	9.0	9.0	8.1	8.0
604	1	7.6	7.8	7.8	7.8	8.6	9.3	9.3	9.5	8.5	8.2	7.6	8.0
701	1	6.4	7.5	7.0	6.2	8.1	7.8	8.3	12.7	11.4	7.8	9.1	7.8
702	1	6.4	5.9	6.4	6.7	8.4	9.5	13.1	12.8	9.9	7.9	6.3	6.6
703	1	6.4	5.8	6.2	6.6	8.2	9.4	13.8	13.9	10.3	7.4	5.8	6.2
704	2	6.6	6.2	6.6	7.4	8.1	10.5	12.3	11.9	9.8	7.8	6.4	6.4
705	1	7.4	6.9	7.5	8.1	7.9	9.5	10.6	10.1	9.1	8.5	7.1	7.3
706	1	7.8	7.7	8.2	8.3	8.3	8.3	8.5	8.4	9.1	8.7	8.2	8.3
707	1	7.4	6.8	7.3	7.5	7.7	9.1	9.8	9.9	10.1	8.6	7.9	8.0
708	0											
709	2	7.6	7.0	7.5	7.6	8.2	9.5	10.4	10.2	9.0	8.1	7.3	7.5
710	1	6.6	6.0	6.4	6.8	8.6	13.3	12.6	10.4	7.8	8.1	6.7	6.7
711	2	7.8	6.4	7.6	6.0	8.3	8.1	11.2	9.7	11.5	8.3	7.1	8.0
712	3	7.5	6.4	7.4	7.2	8.0	10.4	10.9	10.7	9.2	7.7	6.9	7.8
713	1	7.6	7.1	7.8	7.8	8.4	9.6	9.7	9.9	8.8	8.0	7.5	7.7
714	0											
801	1	8.3	7.8	7.4	7.5	8.4	8.8	9.7	10.0	9.0	8.8	6.9	7.4
802	1	6.7	6.2	7.0	7.3	8.8	11.5	10.0	10.3	9.8	8.2	7.0	7.3
803	0											
804	1	6.6	6.6	6.3	6.6	8.6	8.8	9.6	10.6	11.0	9.7	8.3	7.2
805	1	7.8	7.4	7.5	7.3	7.3	8.9	9.0	10.4	9.7	8.4	8.5	7.8
806	1	7.7	8.0	7.2	7.2	7.8	8.7	8.1	9.0	9.7	9.8	8.9	7.9
807	2	6.8	6.6	7.7	8.9	9.0	11.4	9.1	8.0	8.9	8.7	7.4	7.5
808	1	7.5	6.6	7.6	7.8	8.6	10.1	9.5	8.7	8.8	8.9	8.0	7.8
809	0											
901	1	6.8	6.6	6.6	7.0	7.6	9.2	10.6	12.7	11.3	8.2	7.0	6.6
902	1	7.7	7.3	7.4	7.1	7.6	9.0	10.3	11.3	9.2	8.4	7.2	7.4
903	1	7.6	7.1	7.9	7.6	8.6	9.1	9.8	9.2	8.8	8.4	7.6	8.3
1001	0											
1002	2	5.0	4.9	4.8	5.2	7.8	10.4	18.8	16.1	10.7	6.2	5.2	4.8
1003	1	4.2	4.4	4.0	3.9	4.5	7.0	9.9	13.8	21.2	16.1	6.4	4.8
1004	0											
1005	1	5.5	5.0	5.7	6.9	9.2	9.5	17.1	15.1	9.3	6.0	5.4	5.4
1006	0											
1007	1	5.9	2.5	3.8	5.2	5.6	12.1	11.5	16.8	16.0	11.8	4.8	4.0
1008	1	4.8	4.8	4.4	5.2	8.3	13.4	14.8	15.3	12.4	6.7	5.1	4.8
1009	1	6.7	5.3	5.8	4.6	7.1	6.1	11.6	12.1	17.2	9.6	9.2	4.6
1010	1	5.3	4.7	5.2	5.5	8.0	11.3	17.1	16.1	11.1	5.8	4.9	5.1

1011	1	5.9	5.4	5.8	6.5	9.7	11.6	14.5	14.0	8.8	6.4	5.7	5.8
1012	1	4.8	5.2	5.0	5.4	5.8	10.3	15.8	17.2	12.4	7.4	5.7	5.0
1013	2	6.2	6.2	5.8	7.2	7.0	9.3	12.9	12.9	12.3	7.6	6.4	6.3
1014	1	7.0	3.5	4.3	5.6	7.2	8.6	18.7	21.7	9.3	5.5	4.6	3.9
1015	2	3.9	3.9	4.0	4.7	10.1	14.2	19.0	15.6	10.6	6.0	3.9	4.0
1016	0												
1017	1	6.5	5.9	6.6	7.0	8.4	9.7	13.6	12.5	9.1	7.6	6.4	6.6
1018	2	5.1	4.8	5.2	5.4	8.6	13.4	16.0	14.7	10.4	6.5	5.0	4.9
1019	2	5.6	5.1	5.8	6.5	9.5	11.1	14.2	12.8	11.1	7.4	5.2	5.7
1020	3	5.7	5.2	5.7	6.8	10.7	12.4	14.1	11.2	8.8	7.9	5.9	5.6
1021	1	5.8	5.2	5.7	6.7	9.8	10.7	13.8	12.0	9.8	8.4	6.3	5.8
1022	1	6.3	6.3	6.5	6.3	7.4	8.9	12.3	12.6	10.0	9.2	7.7	6.6
1023	1	6.3	5.7	6.1	7.0	8.3	9.6	13.1	12.5	10.8	8.5	6.1	6.1
1024	1	7.4	6.9	7.3	7.7	8.2	11.9	10.6	10.0	8.4	7.8	6.7	7.1
1025	1	4.5	5.0	5.3	6.8	10.4	14.9	12.6	12.0	11.4	7.7	4.9	4.6
1026	1	6.1	5.9	6.4	7.3	7.9	11.0	11.6	10.6	8.9	9.4	8.0	7.0
1027	1	7.3	6.6	7.1	7.7	8.2	9.4	11.6	11.3	8.8	8.0	6.9	7.1
1028	3	7.9	7.7	7.5	8.4	8.1	8.8	9.2	9.7	9.1	8.2	7.7	7.8
1029	1	7.0	6.4	6.3	7.4	8.1	10.6	10.2	11.5	9.4	9.7	6.8	6.7
1030	1	5.3	4.9	5.4	8.1	9.6	11.4	13.1	12.9	10.1	8.4	5.4	5.3
1101	1	7.2	6.6	7.3	7.5	8.4	8.9	10.4	11.0	9.6	8.8	7.2	7.1
1102	1	4.3	3.7	4.2	6.6	9.6	13.8	14.2	13.5	11.7	8.7	5.3	4.4
1103	1	6.8	6.0	6.7	7.5	9.2	9.1	11.1	10.6	10.7	8.7	6.8	6.7
1104	1	3.6	3.8	4.6	6.9	9.1	14.6	10.7	14.7	11.6	10.8	6.0	3.6
1105	0												
1106	1	6.4	5.9	6.7	11.9	8.1	9.0	10.4	11.1	9.9	8.1	6.5	6.2
1107	1	6.8	6.4	6.9	7.7	8.9	9.9	11.7	10.2	9.7	8.0	6.7	6.9
1108	1	6.3	5.2	6.0	7.5	10.4	12.4	13.6	11.7	8.5	7.1	5.9	5.4
1109	2	5.6	5.1	6.3	7.6	10.0	11.2	12.6	11.8	10.1	7.4	6.4	6.0
1110	1	6.8	6.0	6.8	7.6	9.1	9.7	12.2	11.3	9.2	7.9	6.9	6.7
1111	1	7.5	6.5	7.4	7.6	8.5	8.8	10.2	10.4	9.2	8.7	7.6	7.5
1112	1	6.6	6.0	7.2	7.9	9.8	13.6	10.3	11.4	6.9	7.9	6.9	5.6
1113	2	8.2	6.5	6.5	7.3	8.3	9.6	12.7	11.0	9.0	8.0	6.6	6.4
1114	1	7.0	5.7	6.4	7.0	8.5	10.2	12.1	12.0	8.9	8.7	7.2	6.5
1201	0												
1202	2	7.6	6.3	7.0	7.8	8.7	9.8	10.5	11.2	9.3	8.3	6.9	6.7
1203	5	6.8	5.8	6.5	7.1	8.3	9.5	11.7	11.7	10.2	9.3	7.2	6.1
1204	2	7.6	6.2	7.1	7.7	9.3	9.7	10.2	10.1	7.7	9.0	8.4	7.0
1205	2	6.4	6.2	7.1	8.2	9.6	10.9	11.9	11.0	8.3	7.4	6.7	6.2
1206	3	6.6	6.5	6.6	7.5	9.2	10.9	12.2	11.5	8.4	8.2	6.4	6.1
1207	1	6.6	6.2	6.0	7.4	7.2	9.5	9.9	10.4	11.9	9.4	7.7	7.8
1208	0												
1209	3	6.1	5.5	7.0	8.0	9.0	9.9	11.8	11.8	9.5	8.5	6.2	6.6
1210	2	7.6	6.9	7.5	7.6	8.6	9.3	10.2	10.5	9.1	8.4	7.2	7.2
1211	4	7.1	6.6	7.6	7.8	8.4	8.8	9.8	10.1	8.8	8.8	8.2	8.1
1301	1	3.8	3.6	3.9	6.7	12.9	15.4	14.7	13.3	10.7	7.3	3.9	3.9
1302	1	5.2	4.8	5.0	6.2	7.8	12.8	14.8	12.4	11.6	8.6	5.9	4.8
1303	0												
1304	2	8.3	7.7	6.5	6.6	8.4	9.8	9.7	8.6	7.5	9.3	9.1	8.4
1305	1	8.0	8.9	10.1	4.8	7.7	9.0	8.2	7.3	10.9	7.9	9.1	8.2
1306	0												
1307	2	5.7	5.1	6.0	10.3	9.2	11.1	11.1	8.5	10.7	6.8	9.9	5.6
1308	1	6.8	6.6	7.6	7.8	9.4	9.7	11.1	10.6	8.7	8.3	7.0	6.5
1309	0												
1401	1	4.7	4.6	4.4	5.3	8.8	11.1	14.0	14.1	12.3	9.4	6.4	4.8
1402	1	5.1	4.7	5.7	7.8	11.3	12.7	14.1	11.9	9.1	7.1	5.1	5.3

1403	1	2.3	3.7	4.1	9.1	15.0	17.5	12.8	13.5	7.2	7.2	4.4	3.2
1404	2	4.9	4.6	4.8	5.2	9.9	13.2	17.2	15.1	10.1	5.9	4.4	4.6
1405	1	6.0	5.5	6.4	6.0	8.3	14.5	14.3	12.6	8.3	6.4	5.7	6.2
1406	1	5.3	6.0	6.6	9.9	12.5	14.6	12.3	9.0	6.4	5.5	5.9	5.9
1407	1	3.5	3.1	4.8	7.9	10.9	13.1	15.7	12.6	11.5	8.2	4.8	3.9
1408	1	5.9	5.4	5.7	6.4	8.3	10.9	12.7	11.8	11.0	8.9	6.6	6.3
1501	1	5.6	5.4	6.6	7.4	10.2	11.0	11.7	11.8	10.0	8.0	6.5	5.8
1502	1	6.1	6.1	6.0	8.1	10.5	13.3	10.2	8.2	11.5	7.7	6.3	6.0
1503	1	7.0	6.4	6.8	6.9	8.7	9.8	10.8	10.4	9.9	8.5	7.5	7.3
1504	1	5.4	5.4	5.3	7.4	9.5	12.0	12.6	10.5	10.0	8.9	7.2	5.7
1505	1	6.4	5.9	7.2	8.1	9.9	10.9	10.7	9.4	9.0	8.5	7.3	6.6
1506	1	6.0	5.1	5.4	7.3	8.4	10.7	11.8	10.1	10.0	9.1	8.0	8.1
1507	1	6.2	4.8	5.5	6.5	8.1	10.2	11.3	11.5	10.5	10.1	7.6	7.7
1508	1	4.6	3.6	4.0	4.4	13.1	17.1	16.1	11.3	10.3	6.4	4.7	4.4
1601	1	4.9	5.0	5.3	2.0	3.5	10.1	15.5	16.7	15.2	10.6	5.8	5.4
1602	1	4.9	3.7	4.2	4.9	5.1	11.0	11.0	18.8	15.8	9.4	5.7	5.6
1603	1	4.4	3.4	3.9	5.0	8.3	13.7	18.2	14.2	13.7	7.4	4.1	3.7
1604	1	4.1	3.8	4.5	4.7	12.3	13.8	14.5	15.5	11.7	6.6	4.3	4.3
1605	1	4.1	3.7	4.2	5.4	8.2	12.3	14.5	14.2	13.8	10.3	5.5	3.9
1606	1	4.4	5.6	5.2	5.6	7.6	10.4	11.8	11.6	12.9	10.7	7.7	6.6
1701	1	4.7	4.7	4.9	6.2	9.4	11.9	15.9	15.7	10.7	6.3	4.7	4.9
1702	1	5.3	5.1	6.7	7.5	9.7	10.8	13.6	13.1	10.3	7.5	5.0	5.3
1703	1	4.8	4.8	7.2	8.0	8.7	10.2	12.5	13.4	10.4	8.0	6.8	5.3
1704	1	4.3	4.0	4.4	5.2	9.3	13.5	17.4	15.3	10.7	7.4	4.2	4.2
1705	1	7.0	6.3	7.8	7.5	8.5	9.5	11.4	10.7	8.8	8.6	7.2	6.7
1706	1	3.8	3.9	4.8	5.3	9.3	11.7	18.0	17.0	12.3	6.0	3.9	3.9
1707	1	3.8	3.5	4.2	6.1	8.0	13.1	17.1	16.2	12.6	8.1	3.7	3.7
1708	1	6.6	6.0	7.1	6.6	7.3	8.1	12.4	14.6	11.1	7.2	6.5	6.6
1709	1	7.0	7.0	7.1	7.2	7.8	9.9	12.4	12.3	9.1	7.1	6.5	6.6
1710	1	7.1	6.5	7.6	8.5	8.6	9.2	9.5	9.4	9.0	9.3	8.2	7.1
1711	1	7.5	7.3	7.4	7.4	7.2	8.0	8.8	12.4	11.1	9.5	6.8	6.8
1712	0												
1801	1	5.2	4.9	6.4	6.4	8.6	11.8	12.2	12.7	11.3	9.0	5.9	5.5
1802	2	3.1	3.0	4.0	5.2	7.8	9.7	11.9	12.7	12.2	11.3	9.7	9.3
1803	2	3.8	4.0	5.1	5.7	9.8	12.2	13.7	13.6	11.5	9.2	6.3	5.1
1804	1	4.8	4.5	5.3	7.2	9.2	11.1	12.5	12.6	10.6	9.9	7.1	5.3
1805	1	6.2	6.3	6.0	7.3	7.6	10.2	10.5	11.0	10.6	9.9	7.3	7.1
1806	2	6.0	5.8	6.1	6.7	7.4	9.2	11.4	10.3	10.4	10.2	8.6	7.9
1807	2	5.5	4.7	5.1	4.3	10.8	11.2	12.7	13.2	12.2	7.2	6.0	7.1
1808	1	3.5	3.8	3.6	5.6	7.3	12.2	15.0	16.4	13.7	9.3	5.7	3.9
1809	1	4.4	4.2	4.9	6.8	11.0	11.5	13.9	13.1	11.2	8.4	5.3	5.3
1810	1	5.4	4.4	4.9	7.8	8.5	9.8	12.9	10.9	11.5	8.8	7.8	7.3
Sum/av	232	6.6	6.2	6.7	7.2	8.6	10.2	11.4	11.2	9.9	8.3	7.0	6.7

Table 2. Monthly distribution of annual municipal water delivery for four clusters of 4-digit basins

uster	No. of basins	N. of cities	Percent											
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	115	154	7.5	7.0	7.5	7.7	8.4	9.3	9.9	9.9	9.1	8.4	7.7	7.5
2	26	31	5.1	4.8	5.5	7.1	10.4	13.0	13.3	12.1	9.9	7.8	5.7	5.2
3	24	27	5.5	5.0	5.5	6.0	7.6	9.9	12.5	13.4	12.4	9.4	6.7	6.0
4	16	20	4.7	4.3	4.6	5.5	8.7	12.1	16.9	16.1	11.4	6.7	4.7	4.5
Sum	181	232												

Table 3. Monthly distribution of annual municipal water delivery for five clusters of 4-digit basins

Cluster	No. of basins	N. of cities	Percent											
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	81	104	7.8	7.3	7.8	7.8	8.3	9.0	9.4	9.5	9.0	8.4	7.8	7.8
2	5	5	5.3	4.2	4.6	4.1	5.2	9.3	11.9	15.6	17.1	11.5	6.4	4.9
3	21	26	4.8	4.5	5.2	6.8	10.7	13.3	13.8	12.8	10.2	7.6	5.3	5.0
4	17	21	4.7	4.3	4.6	5.5	8.4	12.0	16.8	15.9	11.5	7.1	4.9	4.5
5	57	76	6.4	5.9	6.4	7.3	8.5	10.3	11.6	11.3	9.9	8.5	7.1	6.7
Sum	181	232												

Table 4. Monthly distribution of annual municipal water delivery for ASRs

ASR	No. of basins	N. of cities	Percent											
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
101	4	4	8.7	7.8	8.3	8.0	8.2	8.5	8.9	9.4	8.2	8.2	7.8	8.0
102	2	2	7.2	6.9	7.2	7.5	8.0	9.7	10.5	10.8	9.7	8.1	7.3	7.2
103	1	1	7.5	7.6	7.5	7.6	7.7	9.4	9.9	10.6	9.9	7.8	7.4	7.3
104	1	1	7.8	7.1	7.4	7.3	8.5	9.2	10.5	10.2	8.9	8.2	7.4	7.5
105	1	1	8.0	7.2	8.1	7.9	8.4	8.7	10.1	10.4	8.4	8.0	7.4	7.4
106	0	0												
201	1	1	8.5	8.4	8.9	8.0	8.3	8.5	8.3	9.0	7.9	8.1	8.0	8.1
202	0	0												
203	1	1	9.9	8.1	7.9	7.6	7.7	7.9	9.4	8.2	8.1	9.1	8.1	8.0
204	1	1	8.1	8.8	7.6	8.3	8.0	8.4	9.0	8.9	9.1	8.1	7.7	8.0
205	2	5	7.9	7.2	7.9	7.8	9.0	9.0	9.0	9.7	8.4	8.3	7.9	7.8
206	1	1	8.4	8.0	8.3	8.2	8.6	8.6	8.8	8.9	8.4	8.2	7.4	8.1
207	1	1	7.6	6.8	8.5	6.6	6.6	8.8	7.9	9.4	10.9	8.4	8.8	9.7
301	3	3	7.9	7.1	7.9	7.8	8.5	8.7	9.2	9.6	9.1	8.7	7.7	7.8
302	2	2	7.6	6.8	7.8	8.2	9.4	9.4	9.6	9.5	8.6	8.5	7.5	7.1
303	2	3	6.7	6.0	6.3	7.8	9.5	9.8	10.4	9.8	9.7	8.6	8.2	7.0
304	3	3	7.4	7.7	8.4	8.8	9.5	9.2	8.4	8.5	8.7	7.7	7.9	7.8
305	1	1	7.7	7.8	8.3	9.0	9.2	8.5	8.5	8.5	7.9	8.4	8.3	7.9
306	2	3	7.6	7.0	8.1	8.8	9.0	9.6	9.0	8.6	8.3	8.6	7.9	7.6
307	2	3	7.5	7.6	6.7	7.8	8.3	9.6	8.7	8.8	9.8	9.0	9.0	7.3
308	1	1	7.5	6.7	7.3	7.8	8.5	10.0	10.3	9.6	8.5	8.3	7.6	7.9
309	2	2	7.7	6.9	6.4	7.3	7.5	10.4	9.6	9.7	9.7	8.4	8.6	7.9
401	2	3	7.9	7.5	8.0	7.9	7.8	8.6	10.0	9.8	8.8	8.3	7.5	7.9
402	1	2	7.8	7.1	7.8	7.6	8.2	9.1	11.1	8.9	8.4	8.3	7.5	8.1
404	2	3	7.2	7.2	7.6	7.1	7.9	8.1	9.5	11.1	9.8	8.9	8.3	7
405	2	2	8.1	7.4	8.1	7.9	8.4	8.9	10.2	9.7	8.5	7.8	7.4	7.
406	2	2	7.2	6.8	7.0	7.2	7.7	9.3	9.9	10.3	10.9	8.6	7.6	7.5
407	1	1	8.3	7.7	8.2	7.8	8.2	9.8	9.6	9.7	8.2	7.6	7.2	7.8
408	2	3	8.3	7.1	7.9	8.0	7.5	9.9	9.6	9.0	8.5	8.6	7.6	8.1
501	0	0												
502	3	4	8.3	7.9	8.3	8.0	8.3	8.7	9.1	9.3	8.3	8.1	7.8	8.1
503	3	3	7.9	7.2	7.9	7.8	8.5	9.6	9.3	9.8	8.5	8.1	7.4	7.8
504	1	1	8.3	8.2	8.5	8.6	8.5	8.3	8.1	8.0	8.9	8.5	8.4	7.8
505	3	4	7.7	7.0	7.9	7.6	8.5	9.3	9.4	10.0	8.4	8.2	8.2	7.9
506	1	1	7.8	7.4	8.9	8.3	8.6	9.2	9.2	9.4	8.4	8.4	6.8	7.6
507	1	1	7.7	7.6	7.6	7.9	8.3	9.3	10.1	9.0	8.6	8.4	7.7	7.9
601	2	2	7.8	7.7	7.3	7.8	8.2	8.8	9.3	9.0	8.9	8.6	8.2	8.2
602	2	2	7.7	7.6	7.6	7.7	8.6	9.0	9.2	9.4	8.8	8.6	7.8	8.0
701	3	3	6.4	6.4	6.5	6.5	8.3	8.9	11.7	13.1	10.5	7.7	7.1	6.9
702	3	4	7.1	6.6	7.1	7.7	7.9	9.7	10.9	10.6	9.6	8.3	7.1	7.2
703	3	4	7.3	6.9	7.4	7.6	8.4	10.3	10.5	9.7	8.7	8.3	7.4	7.5
704	3	6	7.7	6.6	7.6	7.0	8.2	9.4	10.6	10.1	9.8	8.0	7.2	7.8
705	0	0												
801	2	2	7.5	7.0	7.2	7.4	8.6	10.1	9.8	10.1	9.4	8.5	6.9	7.4
802	3	3	7.4	7.4	7.0	7.1	7.9	8.8	8.9	10.0	10.1	9.3	8.6	7.6
803	2	3	7.1	6.6	7.7	8.3	8.8	10.8	9.3	8.4	8.9	8.8	7.7	7.7
901	3	3	7.4	7.0	7.3	7.2	7.9	9.1	10.2	11.0	9.8	8.3	7.3	7.4
1001	1	1	5.5	5.0	5.7	6.9	9.2	9.5	17.1	15.1	9.3	6.0	5.4	5.4
1002	2	3	4.6	4.6	4.4	4.5	6.1	8.7	14.4	15.0	15.9	11.2	5.8	4.8
1003	0	0												
1004	4	4	5.7	4.3	4.8	5.1	7.3	10.7	13.8	15.0	14.2	8.5	6.0	4
1005	4	5	6.0	5.1	5.2	6.2	7.4	9.9	15.5	16.5	10.7	6.7	5.6	5

1006	1	1	6.5	5.9	6.6	7.0	8.4	9.7	13.6	12.5	9.1	7.6	6.4	6.6
007	2	4	5.4	5.0	5.5	6.0	9.0	12.3	15.1	13.7	10.7	6.9	5.1	5.3
.008	4	7	5.4	5.2	5.5	6.1	9.5	11.5	14.8	12.9	9.8	7.9	6.0	5.5
1009	2	2	6.9	6.3	6.7	7.3	8.2	10.7	11.9	11.2	9.6	8.2	6.4	6.6
1010	3	3	6.0	5.8	6.3	7.3	8.8	11.7	12.0	11.3	9.7	8.3	6.6	6.2
1011	3	5	6.7	6.3	6.4	8.0	8.6	10.3	10.8	11.3	9.5	8.8	6.6	6.6
1101	1	1	7.2	6.6	7.3	7.5	8.4	8.9	10.4	11.0	9.6	8.8	7.2	7.1
1102	1	1	4.3	3.7	4.2	6.6	9.6	13.8	14.2	13.5	11.7	8.7	5.3	4.4
1103	3	3	5.6	5.2	6.0	8.8	8.8	10.9	10.7	12.1	10.7	9.2	6.4	5.5
1104	2	2	7.2	6.5	7.2	7.7	8.7	9.3	10.9	10.3	9.5	8.4	7.1	7.2
1105	3	4	6.2	5.4	6.4	7.6	9.8	11.1	12.8	11.6	9.2	7.5	6.4	6.1
1106	2	3	7.4	6.3	6.8	7.6	9.0	11.6	11.5	11.2	7.9	8.0	6.8	6.0
1107	1	1	7.0	5.7	6.4	7.0	8.5	10.2	12.1	12.0	8.9	8.7	7.2	6.5
1201	1	2	7.6	6.3	7.0	7.8	8.7	9.8	10.5	11.2	9.3	8.3	6.9	6.7
1202	2	7	7.2	6.0	6.8	7.4	8.8	9.6	11.0	10.9	9.0	9.1	7.8	6.6
1203	3	6	6.6	6.3	6.5	7.7	8.7	10.4	11.3	11.0	9.5	8.3	6.9	6.7
1204	1	3	6.1	5.5	7.0	8.0	9.0	9.9	11.8	11.8	9.5	8.5	6.2	6.6
1205	2	6	7.4	6.8	7.5	7.7	8.5	9.0	10.0	10.3	8.9	8.6	7.7	7.6
1302	3	3	5.7	5.7	6.3	5.9	9.5	12.4	12.6	11.0	11.1	7.9	6.3	5.6
1303	2	4	7.0	6.4	6.3	8.5	8.8	10.4	10.4	8.6	9.1	8.1	9.5	7.0
1304	0	0												
1305	1	1	6.8	6.6	7.6	7.8	9.4	9.7	11.1	10.6	8.7	8.3	7.0	6.5
1401	3	4	5.4	5.3	5.9	7.0	10.2	14.1	14.6	12.2	8.3	5.9	5.4	5.6
1402	3	3	4.0	4.3	4.7	7.4	11.7	13.8	13.7	13.2	9.5	7.9	5.3	4.5
1403	2	2	4.7	4.3	5.2	7.2	9.6	12.0	14.2	12.2	11.2	8.5	5.7	5.1
1501	1	1	6.1	6.1	6.0	8.1	10.5	13.3	10.2	8.2	11.5	7.7	6.3	6.0
1502	2	2	6.3	5.9	6.7	7.2	9.4	10.4	11.3	11.1	9.9	8.3	7.0	6.5
503	5	5	5.7	5.0	5.5	6.7	9.8	12.2	12.5	10.6	10.0	8.6	7.0	6.5
601	2	2	4.9	4.3	4.7	3.4	4.3	10.6	13.3	17.7	15.5	10.0	5.8	5.5
1602	1	1	4.4	3.4	3.9	5.0	8.3	13.7	18.2	14.2	13.7	7.4	4.1	3.7
1603	2	2	4.2	4.7	4.8	5.1	9.9	12.1	13.1	13.5	12.3	8.6	6.0	5.4
1604	1	1	4.1	3.7	4.2	5.4	8.2	12.3	14.5	14.2	13.8	10.3	5.5	3.9
1701	1	1	4.7	4.7	4.9	6.2	9.4	11.9	15.9	15.7	10.7	6.3	4.7	4.9
1702	3	3	4.6	4.5	6.0	7.2	8.8	11.4	14.4	14.2	11.1	7.9	5.2	4.7
1703	2	2	5.7	5.2	6.1	6.3	8.9	11.5	14.4	13.0	9.7	8.0	5.7	5.5
1704	1	1	3.8	3.9	4.8	5.3	9.3	11.7	18.0	17.0	12.3	6.0	3.9	3.9
1705	3	3	6.9	6.5	7.2	7.4	7.9	9.1	11.4	12.1	9.8	7.8	7.1	6.8
1706	1	1	7.5	7.3	7.4	7.4	7.2	8.0	8.8	12.4	11.1	9.5	6.8	6.8
1707	0	0												
1801	1	1	5.2	4.9	6.4	6.4	8.6	11.8	12.2	12.7	11.3	9.0	5.9	5.5
1802	2	3	3.3	3.4	3.8	5.4	7.6	11.0	13.4	14.6	12.9	10.3	7.7	6.6
1803	2	3	4.3	4.3	5.2	6.5	9.5	11.6	13.1	13.1	11.1	9.5	6.7	5.2
1804	1	1	6.2	6.3	6.0	7.3	7.6	10.2	10.5	11.0	10.6	9.9	7.3	7.1
1805	1	2	6.0	5.8	6.1	6.7	7.4	9.2	11.4	10.3	10.4	10.2	8.6	7.9
1806	2	3	5.5	4.6	5.0	6.0	9.6	10.5	12.8	12.1	11.8	8.0	6.9	7.2
1807	1	1	4.4	4.2	4.9	6.8	11.0	11.5	13.9	13.1	11.2	8.4	5.3	5.3
Sum	181	232												

Table 5. Monthly distribution of annual municipal water delivery for clusters of ASRs

Cluster	No. of ASRs	N. of cities	Percent											
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	25	72	6.4	5.9	6.5	7.3	8.8	10.5	11.6	11.2	9.9	8.4	6.9	6.5
2	16	41	4.8	4.5	5.2	6.4	9.5	12.0	15.0	14.0	10.8	7.6	5.3	5.0
3	45	106	7.8	7.3	7.7	7.8	8.3	9.2	9.5	9.6	9.0	8.4	7.7	7.7
4	5	13	4.5	4.1	4.4	4.8	6.7	10.6	13.9	15.3	14.5	10.0	6.2	5.1
Sum	91	232												

Table 6. Monthly distribution of annual municipal water delivery for WRRs

WRR	No. of basins	N. of cities	Percent											
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	9	9	8.0	7.4	7.9	7.7	8.2	9.0	9.7	10.0	8.8	8.1	7.6	7.6
2	7	10	8.3	7.8	8.2	7.8	8.2	8.6	8.8	9.1	8.7	8.3	8.0	8.2
3	18	21	7.5	7.1	7.5	8.1	8.8	9.4	9.2	9.2	9.0	8.5	8.1	7.6
4	12	16	7.8	7.2	7.8	7.6	7.9	9.0	9.9	9.9	9.1	8.4	7.6	7.8
5	12	14	7.9	7.4	8.1	7.9	8.4	9.1	9.2	9.5	8.5	8.2	7.7	7.9
6	4	4	7.7	7.7	7.5	7.8	8.4	8.9	9.3	9.2	8.8	8.6	8.0	8.1
7	12	17	7.1	6.6	7.2	7.2	8.2	9.6	10.9	10.9	9.7	8.1	7.2	7.4
8	7	8	7.3	7.0	7.3	7.5	8.4	9.7	9.3	9.6	9.5	8.9	7.8	7.6
9	3	3	7.4	7.0	7.3	7.2	7.9	9.1	10.2	11.0	9.8	8.3	7.3	7.4
10	26	35	5.8	5.3	5.6	6.3	8.2	10.7	13.8	13.6	11.0	8.1	6.0	5.6
11	13	15	6.4	5.6	6.4	7.7	9.1	10.8	11.7	11.6	9.6	8.4	6.6	6.1
12	9	24	6.9	6.2	6.9	7.7	8.7	9.8	10.9	10.9	9.2	8.6	7.2	6
13	6	8	6.3	6.1	6.5	7.1	9.2	11.3	11.6	10.1	10.0	8.0	7.5	6
14	8	9	4.7	4.7	5.3	7.2	10.6	13.4	14.2	12.6	9.5	7.3	5.4	5.
15	8	8	5.9	5.4	5.9	7.0	9.8	11.9	11.9	10.4	10.2	8.4	6.9	6.4
16	6	6	4.4	4.2	4.5	4.6	7.5	11.9	14.3	15.2	13.8	9.2	5.5	4.9
17	11	11	5.6	5.4	6.3	6.8	8.5	10.5	13.6	13.6	10.6	7.7	5.8	5.5
18	10	14	4.8	4.6	5.1	6.3	8.8	10.9	12.7	12.6	11.5	9.3	7.0	6.4
Sum	181	232												

igures

Figure 1. Location of four clusters of 4-digit basins for Table 2.

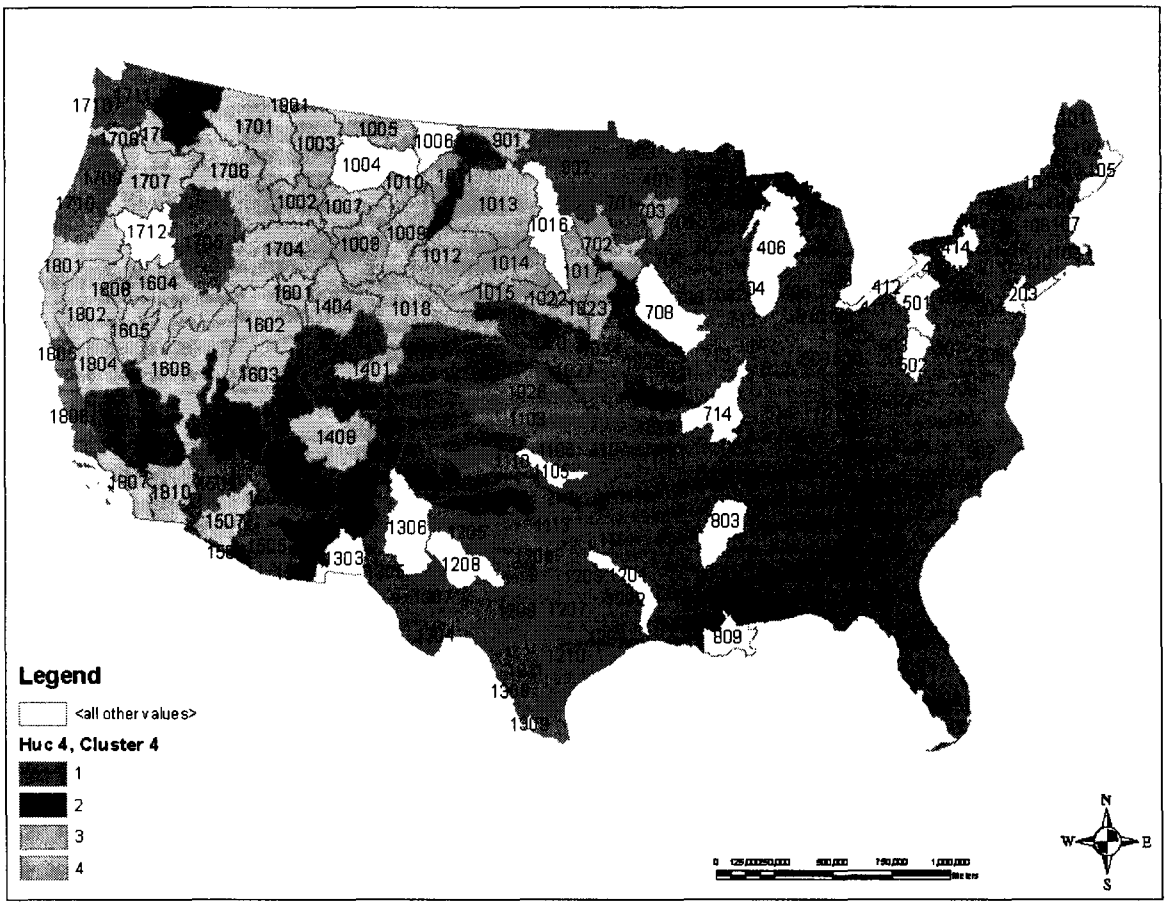


Figure 2. Monthly distribution of annual municipal water delivery for four clusters of 4-digit basins (see Table 2).

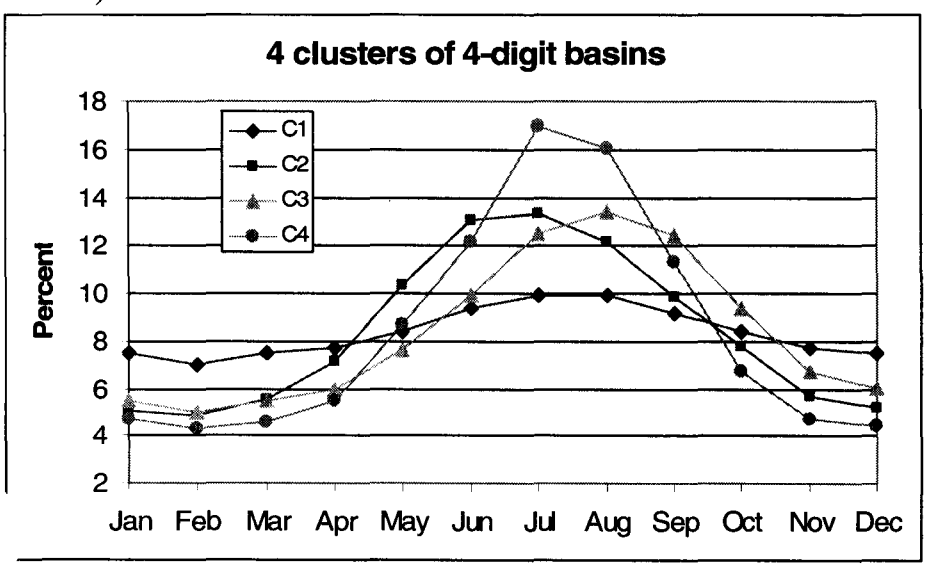


Figure 3. Location of five clusters of 4-digit basins for Table 3.

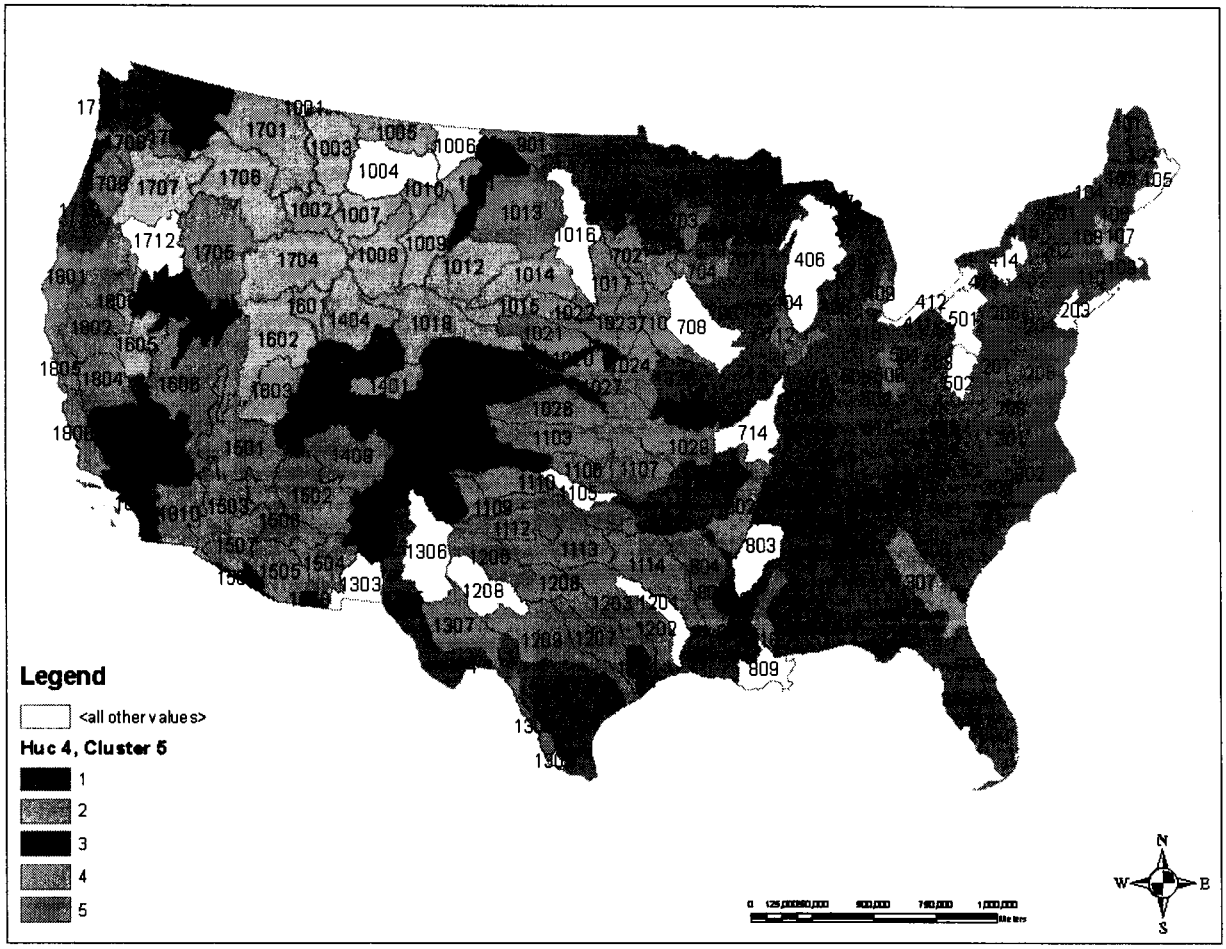


Figure 4. Monthly distribution of annual municipal water delivery for five clusters of 4-digit basins (see Table 3).

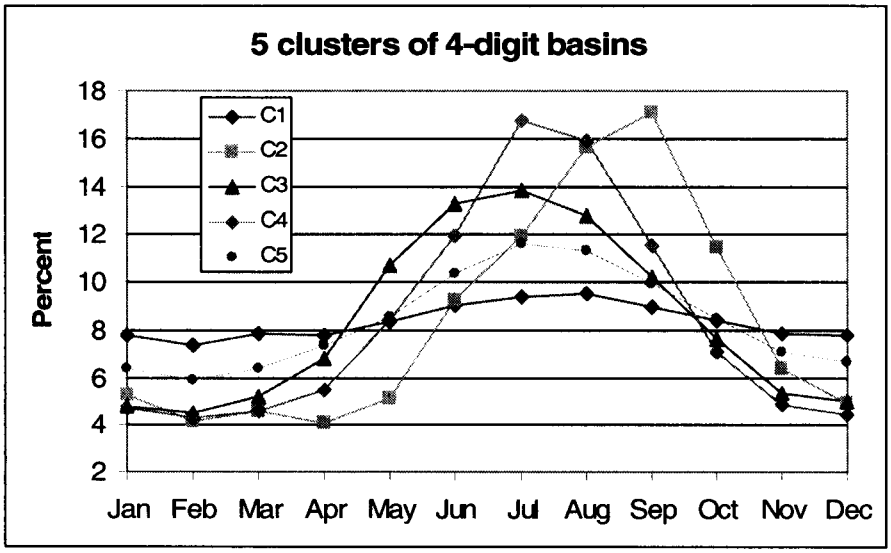


Figure 5. Location of four clusters of ASRs for Table 5.

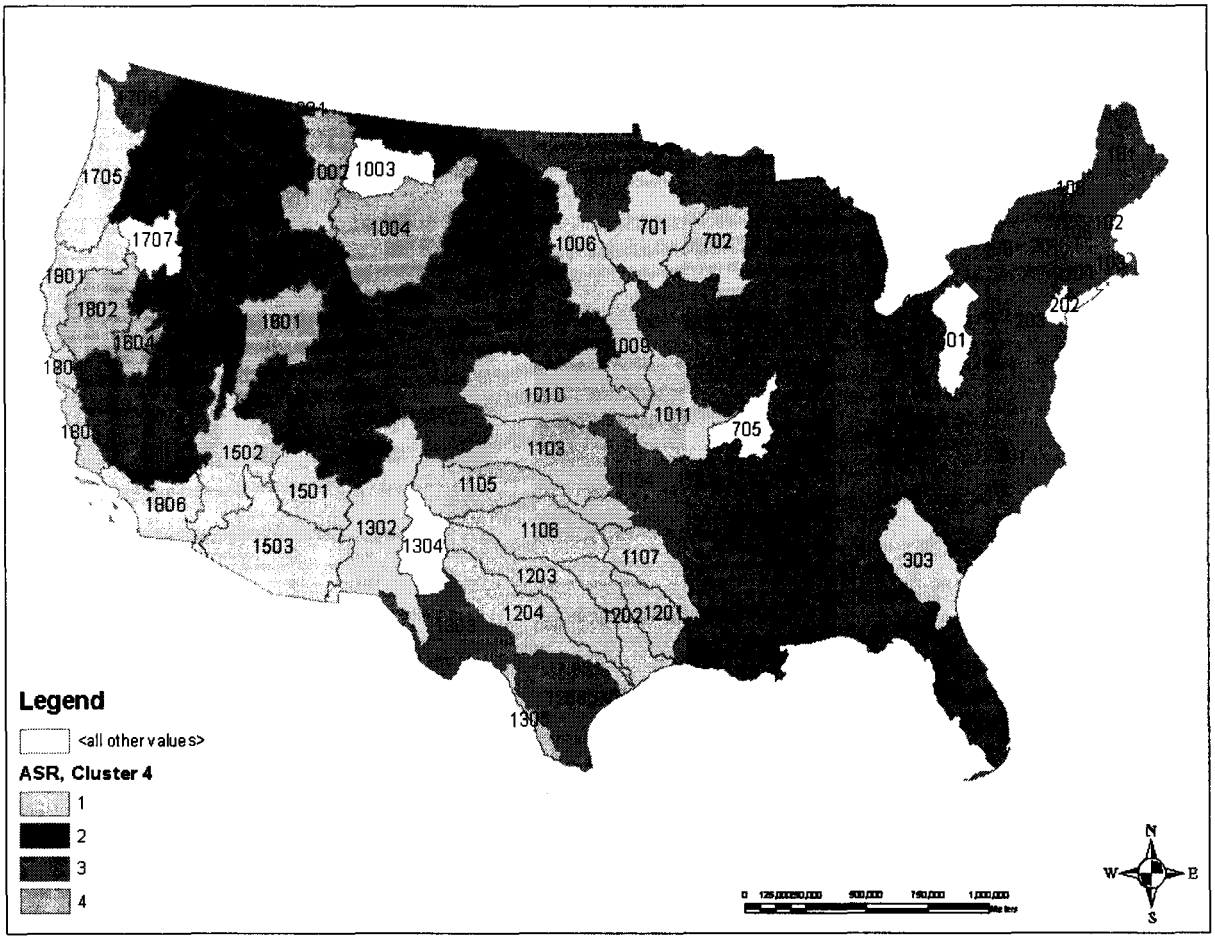


Figure 6. Monthly distribution of annual municipal water delivery for four clusters of ASRs (see Table 5).

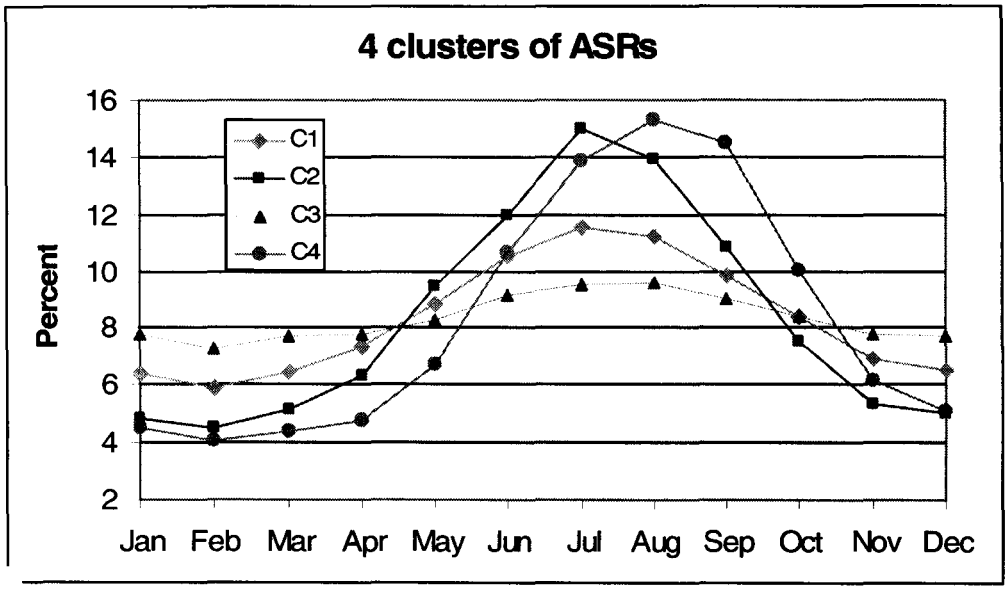
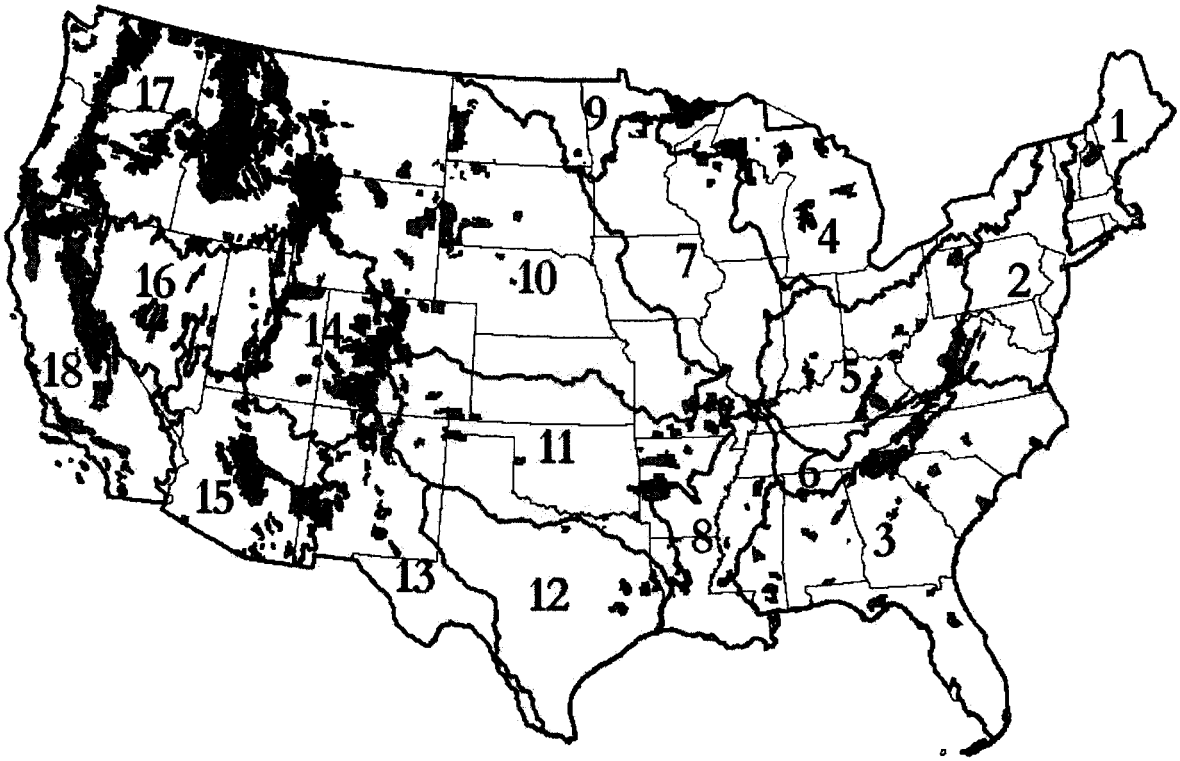


Figure 7. Location of WRRs (also shows national forests and grasslands in green).



Key:

1. New England
2. Mid-Atlantic
3. South-Atlantic-Gulf
4. Great Lakes
5. Ohio
6. Tennessee
7. Upper Mississippi
8. Lower Mississippi
9. Souris-Red-Rainy
10. Missouri
11. Arkansas-White-Red
12. Texas-Gulf
13. Rio Grande
14. Upper Colorado
15. Lower Colorado
16. Great Basin
17. Pacific Northwest
18. California

Figure 8. Monthly distribution of annual municipal water delivery for eastern WRRs (see Table 6).

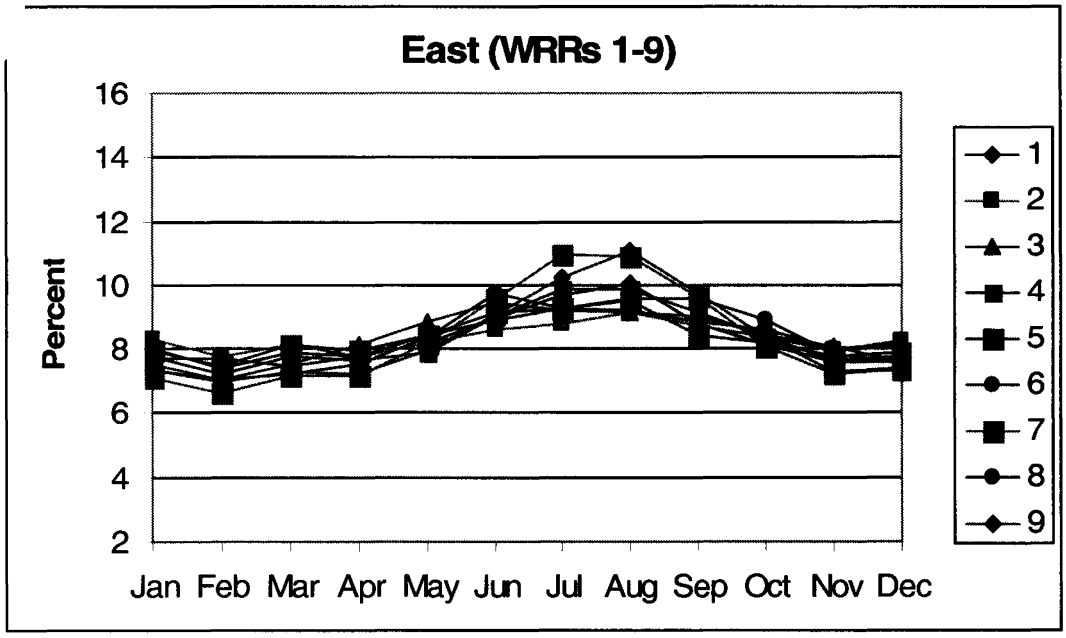


Figure 9. Monthly distribution of annual municipal water delivery for western WRRs (see Table 6).